



American River Flood Control History



1956 Folsom Dam Built

Construction of Folsom Dam was completed in 1956. Folsom Dam is operated to provide flood control, water supply, hydropower, and incidental recreation benefits.

Based on the hydrologic record available during the 1950s, it was thought that Folsom Dam would provide protection from a flood with a 1-in-200 chance of occurring in any year.

1986 Flood

The flood of 1986 was the largest flood ever recorded for the Sacramento and American Rivers. It pushed Sacramento's flood control system to its limit and triggered a major re-evaluation of the system by the U.S. Army Corps of Engineers (Corps).

The re-evaluation identified numerous deficiencies and concluded that large portions of the City of Sacramento did not have protection from a flood with a 1-in-100 chance of occurring in any year.



1991 ARWI Feasibility Report

The ARWI Feasibility Report analyzed Sacramento's flooding problems and identified several potentially feasible solutions. The report recommended construction of a flood control detention dam near Auburn and levee and channel improvements in and around Natomas sufficient to provide Sacramento protection from a flood with a 1-in-200 chance of occurring in any year.

1995 Reoperation of Folsom Dam

In March 1995, SAFCA entered into an agreement with the U.S. Bureau of Reclamation to increase the space available for flood control at Folsom, with the amount of increase depending on storage conditions in three nonfederal reservoirs located in the upper reaches of the American River watershed. This agreement, known as the "reoperation agreement," provides for variable storage space for flood control, further reducing the risk of flooding from the lower American River.

1996 Water Resources Development Act

In 1996, the Corps, the State, and SAFCA again sought congressional approval for a flood control dam at Auburn. As in 1992, Congress did not approve construction of the dam. Instead, Congress authorized a series of lesser improvements, including strengthening the levees along both sides of the lower American River and continuing the variable space operation at Folsom Dam on a long-term basis.

1999 Water Resources Development Act

In 1999, Congress approved the most significant package of improvements to Sacramento's flood control system since the completion of Folsom Dam. These improvements include:

- modifications to the outlet works at Folsom designed to increase the dam's release capacity during the early stages of a flood event;
- improvements to portions of the north and south levees of the lower American River and Mayhew Drain to ensure safe containment of Folsom's emergency spillway release; and
- an updated Flood Management Plan to reflect enhanced operational capacity and improved weather forecasting.

Congress also directed the Corps to study the next possible steps in the flood control improvement process along the lower American River: increasing the design capacity of the existing levee system and/or enlarging Folsom Dam and Reservoir to create more flood control storage space.

1969-70 NEPA/CEQA Enacted

The National Environmental Policy Act (NEPA) was enacted in 1969 in response to an overwhelming national sentiment that federal agencies should take a lead in providing greater protection for the environment.

Similarly, the California Environmental Quality Act (CEQA), requires state, local, and other agencies subject to the jurisdiction of the State of California (State) to evaluate the environmental implications of their actions. Furthermore, it aims to prevent agency actions from affecting the environment by requiring agencies to avoid or reduce the significant environmental impacts of their decisions, when feasible.

Federally sponsored and state-sponsored flood control projects are subject to both NEPA and CEQA.

1988 American River Watershed Investigation

In 1988, Congress directed the Corps to initiate the American River Watershed Investigation (ARWI) to identify feasible solutions to Sacramento's flood problems.

1992 Water Resources Development Act

In 1992, the Corps, the State, and the Sacramento Area Flood Control Agency (SAFCA) sought congressional approval for the recommended flood control dam at Auburn and levee improvements proposed in the 1991 ARWI Feasibility Report.

This effort failed because of strong opposition from environmental interests and supporters of a multipurpose dam. However, Congress authorized the Corps to develop a Flood Management Plan for Folsom Dam and Reservoir. Congress also authorized the Natomas area levee improvements.

1996 ARWI Supplemental Information Report

This report supplemented the 1991 ARWI Feasibility Report by presenting three candidate flood protection plans and identifying a recommended plan.

The main element of the recommended plan was the construction of an expandable flood control dam near Auburn, capable of providing Sacramento with protection from a flood with a 1-in-500 chance of occurring in any year.

1997 Flood

The 1997 flood nearly equaled the record volume and exceeded the peak flow of the 1986 flood. However, as a result of the improvements implemented during the preceding 7 years, Sacramento weathered this storm with a much greater margin of safety than in 1986. Nevertheless, the 1997 flood highlighted Sacramento's continuing vulnerability to uncontrolled flooding along the lower American River and underscored the urgency of continuing efforts to improve the existing flood control system.

2000 Local Assessment District

In June 2000, Sacramento property owners voted overwhelmingly to approve an assessment on properties within the 100-year floodplain to raise the local share of costs of the projects authorized in the 1999 Water Resources Development Act.



Alternatives Selection Process

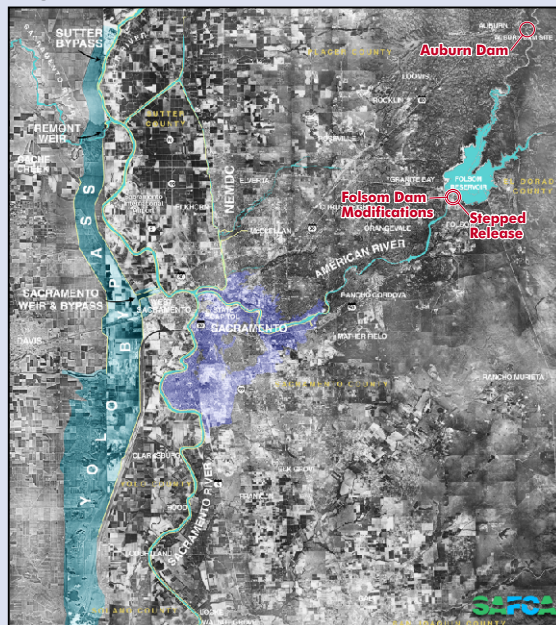
The current study was mandated by Congress as a focused extension of the ongoing American River Watershed Investigation. The purposes of the study are to:

- examine the feasibility of raising Folsom Dam to create additional flood storage capacity, an alternative not pursued in either of the preceding studies;
- re-examine previously studied alternatives (such as increasing the design capacity of the levee system and creating more flood storage space within Folsom Reservoir) in light of the expected accomplishment of the improvements that Congress has already approved; and
- present new information on opportunities for environmental restoration along the lower American River.

The scoping process provides the public the opportunity to suggest new, reasonable alternatives. However, the study will not focus on the flood control dam at Auburn because this option was sufficiently analyzed in the previous studies and Congress has not asked for further examination of it.

Both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) require a comparative analysis of the environmental impacts of proposed projects and alternatives. This analysis will be included in the current study along with information on the costs and benefits, reliability, effectiveness, and acceptability of each alternative. It is anticipated that this information will be presented in draft form to local and state decision-makers in the summer of 2001 so that they may identify a locally preferred plan. This plan will then be the focus of a final report with recommendations to Congress in the spring of 2002.

Regional Flood Control Features



Alternatives

The proposed study will consider the following alternatives:

No-Action. Only improvements previously authorized by Congress would be implemented, including:

- Folsom Dam outlet modifications,
- anticipatory releases,
- Natomas levee work, and
- lower American River levee work.

These improvements are considered "existing", even though construction will not be completed until 2006. This alternative assumes that Congress would authorize no additional flood control improvements along the American River.

Folsom Dam Raise Plan. Folsom Dam would be raised to provide increased reservoir storage space for flood control. Different dam raise alternatives (raises of up to 12 feet) will be included in the evaluation of the Folsom Dam Raise Plan.

Stepped Release Plan. The capacity of the American River channel below Folsom Dam would be increased to accommodate higher flood control releases from the dam. Three increased channel capacity options will be presented:

- 160,000 cubic feet per second (cfs);
- 180,000 cfs; and
- 160,000 cfs, with early release through new outlets at Folsom Dam.

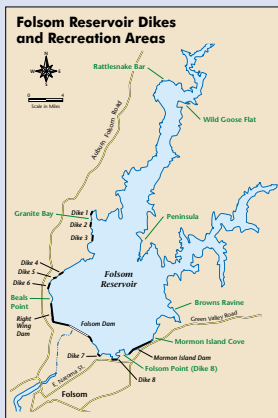
Additional Anticipatory Release Plan. Additional flood control capacity would be created at Folsom Dam by augmenting the updated Flood Management Plan. This alternative goes beyond the flood control elements presently authorized under the No-Action Alternative.

Combination Plan. Various combinations of the above alternatives will be created and assessed.

Other Alternatives. Other reasonable alternatives will also be considered.

Ecosystem Restoration. Opportunities for ecosystem restoration along the lower American River will be studied as a project purpose separate from flood control.

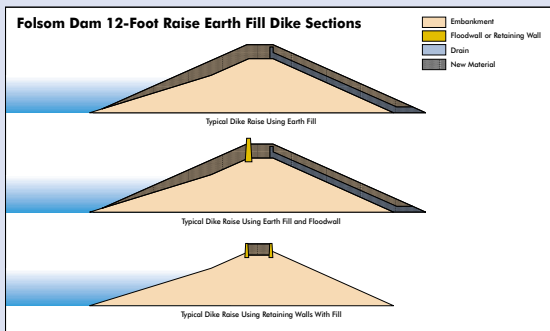
Folsom Dam Raise Plan



Project Description

Under the Folsom Dam Raise Plan, Folsom Dam and Folsom Reservoir dikes would be raised to create additional reservoir storage space to be used exclusively for flood water storage.

Improvements would be designed so that they could be constructed and operated without affecting ongoing water conservation and hydropower operations. Additional improvements include a detour bridge across the American River downstream of Folsom Dam to minimize traffic impacts.



Display #3, 9/29/00

Dam Raise Options

Different dam raise alternatives (raises of up to 12 feet) will be included in the evaluation of the Folsom Dam Raise Plan.

The plan would maintain the current Folsom Dam design flood control release of 115,000 cfs and the emergency release of 160,000 cfs.

Depending on the extent of the dam raise, the Folsom Dam Raise alternative could provide protection from a 210-year flood, which means a flood that has a 1-in-210 (less than 0.5%) chance of occurring in any given year.

Potential Impacts

The environmental impacts associated with the Folsom Dam Raise Plan will be fully evaluated. These impacts could include:

Construction-Related Impacts

- Vegetation
- Wildlife
- Air quality
- Traffic/circulation
- Noise
- Recreation

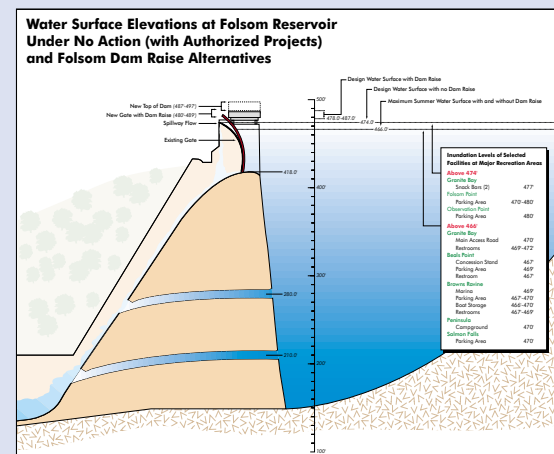
Operation-Related Impacts

- Recreation
- Vegetation
- Wildlife
- Land use

Key Issues

The key issues associated with the Dam Raise Plan include:

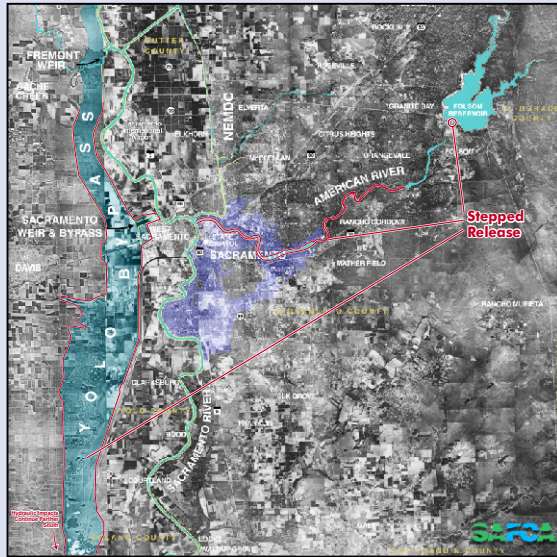
- How much flood protection can be provided?
- What are the estimated costs to construct, operate and maintain the new facilities?
- What effect will the dam raise have on the other uses of Folsom Reservoir?
- How will the construction process be designed?
- How long will construction last?
- What kind of bridge will be constructed to detour traffic from the top of the dam?
- How will traffic impacts be minimized?



Stepped Release

Project Description

Under the Stepped Release Plan, the capacity of the American River channel below Folsom Dam would be increased to accommodate higher flood control releases from the dam. This could entail raising the American River levees up to 3 feet higher than their current elevation, modifying existing drainage and transportation infrastructure along the lower river, and raising and strengthening portions of the levee system along the Sacramento River and the Sacramento and Yolo Bypasses.



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Stepped Release Options

The plan would be designed to preserve existing levels of service for infrastructure along the American River. It would also be designed to maintain the current flood protection capability of the levee system, protecting property outside the American River watershed, including property near the Sacramento and Yolo Bypasses.

Flood Control Releases

Options for increased channel capacity will be evaluated within this range:

- Increase design flood control release from 115,000 cubic feet per second (cfs) to 145,000 cfs; emergency release remains at 160,000 cfs.
- Increase design flood control release from 115,000 cfs to 145,000 cfs; emergency release increased to 180,000 cfs.
- Increase design flood control release from 115,000 cfs to 145,000 cfs; emergency release remains at 160,000 cfs with new outlet works at Folsom Dam.

Depending on the extent of the increase in channel capacity, this alternative could provide a level of flood protection as great as a 1-in-170 chance of flooding in any year.

Potential Impacts

The environmental impacts associated with the Stepped Release Plan will be fully evaluated. These impacts could include:

Construction-Related Impacts

- Traffic/circulation
- Air quality
- Noise
- Vegetation
- Wildlife

Operation-Related Impacts

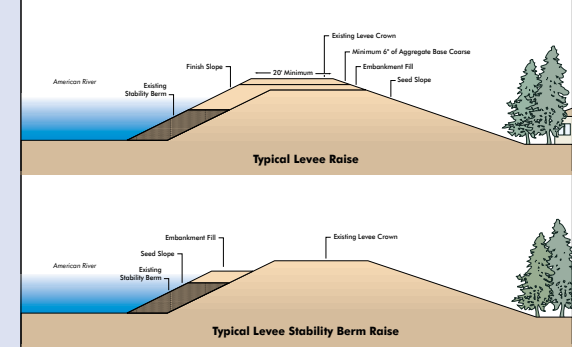
- Levee integrity
- Interior drainage
- Fisheries
- Transportation

Key Issues

The key issues associated with the Stepped Release Plan include:

- How much flood protection can be provided?
- What are the estimated costs to construct, operate, and maintain the new facilities?
- What effect will changes in channel capacity have on lands protected by levees outside the American River watershed, including the Sacramento and Yolo Bypasses?
- How will the construction be designed?
- How long will construction last?
- How will the Howe Avenue Bridge be modified to accommodate the 180,000 cfs option?
- How will the plan affect the American River Parkway?

Levee Raise Cross Sections



Project Description

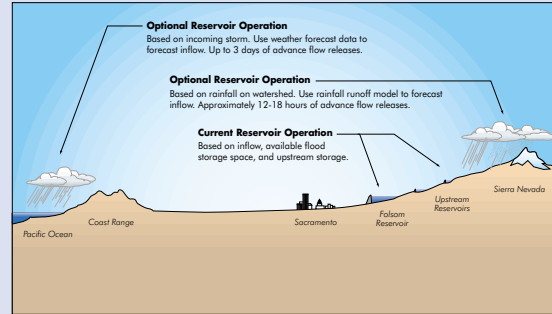
Currently, Folsom Dam flood releases are based on actual inflow to Folsom Lake. The Corps is in the process of updating the Folsom Flood Management Plan which will provide for advance releases that will not impact existing uses of the dam. These releases may be based on forecasting inflow from measured precipitation in the watershed or from weather data of incoming storms.

Under the Additional Anticipatory Release Plan, additional flood storage would be created within the existing configuration of Folsom Reservoir by releasing water from the reservoir based on forecasted flood inflows. Outflows from the reservoir would be allowed to exceed inflow. This alternative would augment the Flood Management Plan. This plan differs from the Flood Management Plan as it may impact water supply or other dam uses.

The Additional Anticipatory Release Plan would be designed to increase flood storage space only in anticipation of very large flood inflows so as to minimize the risk of any resulting impacts to the other uses of Folsom Reservoir. The plan would be operational in nature and would require no additional physical improvements to the dam.

Anticipatory Release Options

Options would vary by how much in advance of peak inflow releases would be made, and by the amount of flow that would be released.



Potential Impacts

The environmental impacts associated with Additional Anticipatory Release Plan will be fully evaluated. These impacts could include:

Operation-Related Impacts

- Water Supply
- Hydropower
- Recreation
- Fisheries

Key Issues

The key issues associated with the Additional Anticipatory Release Plan include:

- How reliable is the flood protection provided by the plan given the current state of weather forecasting?
- What affect could the plan have on other uses of Folsom Reservoir if anticipated reservoir inflows do not materialize?
- How will the potential costs of the plan be identified and funded?

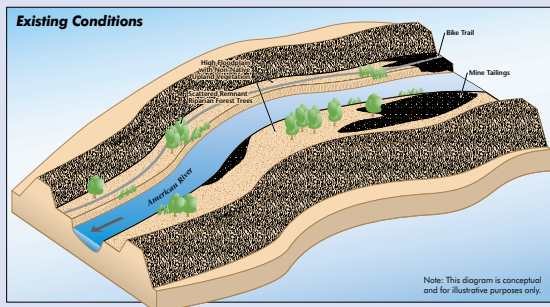
Mission and Vision of Ecosystem Restoration: An Overview

Ecosystem restoration is one of the primary missions of the U.S. Army Corps of Engineers' (Corps') Civil Works program.

The purpose of ecosystem restoration is to restore significant ecosystem function, structure, and dynamic processes that have been degraded. The intent of restoration is to reestablish the attributes of a naturalistic, functioning, and self-regulating system.

The Corps' mission of protecting, restoring, conserving, and managing ecological resources has taken on greater importance over recent decades. The lower American River study is an example of evaluating habitat restoration opportunities as part of a broader regional water resources management program authorized by Congress.

The stated purpose of ecosystem restoration efforts is to comprehensively examine the problems that contribute to system degradation and to develop alternative means of solving these problems.



Key Problems and Opportunities in the Lower American River Ecosystem

The combination of a century-and-a-half of mining, development, floodplain constriction, dam construction, and flow modifications have altered the physical processes that sustain ecosystem values, thereby contributing to significant degradation of the lower American River ecosystem. Some of the problems and opportunities within this ecosystem include:

Problem: High floodplains produced by deposition of sandy sediments from upstream hydraulic mining during the Gold Rush are disconnected from the ordinary flow of the river, except in very high flow events. Without a regular cycle of frequent inundation bringing water to the unnaturally high terraces and shallower water tables, native plant species cannot regenerate adequately.

Opportunity: Removing excess soil to reestablish more frequent inundation and a shallower water table facilitates a more natural hydrologic cycle for native plant establishment and makes a larger area subject to frequent inundation. This work results in healthy, diverse riparian communities and overall habitat improvement.

Problem: Channel downcutting between the high floodplain banks results in a lack of shallow aquatic habitat along channel edges, which is important to juvenile fish rearing. This also results in a lack of shallow, slow-water sidechannels and other off-channel aquatic habitats that are important to both fish rearing and fish spawning.

Opportunity: High quality fish rearing habitat can be created by cutting benches to lower bank elevations, or by constructing shallowly submerged fill benches along the channel edges, together with placing instream woody material and planting riparian vegetation near the shoreline.

Problem: The dry upland conditions of the high floodplains and the modified hydrologic cycle allow **invasive non-native plants** to outcompete the native species, because non-native plants are better adapted to these dry conditions. The system generally lacks vegetative cover and diversity.

Opportunity: Creating more frequent inundation, combined with removing invasive non-native species and planting native riparian plants, enhances ecological function.

Problem: Dredger tailings in the form of bars and deposits along the riverbanks and on the floodplain provide a poor substrate for riparian plants and less-than-optimal fish and wildlife habitat values. Upstream dams have eliminated transport of sediment downstream and slowed the development of substrate for plant colonization.

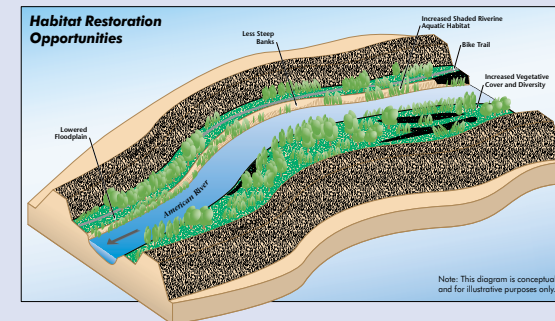
Opportunity: Removing and redistributing large river cobble, combined with reintroducing fine-grained bank material, may foster conditions more suitable for regeneration of native riparian vegetation.

Problem: Deep pools occur in several locations where the river captured abandoned gravel mining pits. These pools provide **habitat for predator fish** that prey on juvenile salmon.

Opportunity: Filling excessively deep pools, lowering the floodplain, developing sidechannels, and disposing of dredger tailings could eliminate predator habitat and increase juvenile salmon survival.

Restoration Objectives for the Lower American River Ecosystem

1. Enhance values of plant, wildlife, and aquatic habitat.
2. Increase shaded riparian aquatic cover.
3. Increase the diversity of floodplain habitat.
4. Improve connectivity between the low-flow channel and river floodplains.
5. Enhance habitat for Sacramento splittail and anadromous fish.
6. Facilitate establishment of native plant species.
7. Enhance recreation and educational opportunities by developing high-quality riparian and aquatic habitats.
8. Ensure compatibility with flood control system and proposed improvements.



Developing an Ecosystem Restoration Plan

This study will follow these steps:

- Identify sites in the lower American River that present promising restoration opportunities.
- Design measures appropriate to the sites that satisfy restoration objectives.
- Analyze and compare measures in terms of cost and effectiveness.
- Select a subset of the best measures to form a best alternative plan.

The American River Long Term Study will incorporate this ecosystem restoration plan with a flood control plan.